A Waterfall on the Move

Part 2: The Recession of St. Anthony Falls- 1680 to 1876

Objective:
The student will calculate the distance and rate of recession of St. Anthony Falls between 1680 and 1876 using a map developed by N. H. Winchell in the 1870s. The student will graph the recession of St. Anthony Falls. The student will understand why St. Anthony Falls receded at different rates during different time periods.

Grade Level: Grades 4-6

Time required: 1 hour total; 30 minutes for calculations, 30 minutes for reading and discussion

Materials: Map developed by N. H. Winchell showing recession of St. Anthony Falls, calculator (optional), "A Waterfall on the Move: Part 2- The Recession of St. Anthony Falls" worksheets.

Standards:
History and Social Studies- Geography- D. Interconnections- The student will describe how humans influence the environment and in turn are influenced by it. 1. Students will recognize changes over time in nearby landscapes resulting from human occupation.
Science- Earth and Space Science- A. Earth Structure and Processes- The student will explore the structures and functions of Earth systems. 1. The student will recognize the natural processes that cause rocks to break down into smaller pieces and eventually into soil. 3. The student will describe how (water and ice) shaped and reshaped the earth's surface.
Math- Data Analysis and Graphing

Resources for Teachers/Students:
First Came the River booklet

River of History
http://www.nps.gov/miss/historyculture/collections.htm

Engineering the Falls
http://www.mvp.usace.army.mil/docs/history/engineering.pdf

Forest Fields and Falls
http://discovery.mnhs.org/ConnectingMN/

Wheat Farms, Flour Mills, and Railroads: A Web of Interdependence
http://www.nps.gov/history/nr/twhp/wwwlps/lessons/106wheat/106wheat.htm

Journey to the Falls Student Activity: Geography, Math

A Waterfall on the Move
Part 2: St. Anthony Falls from 1680 to 1876

When Father Hennepin visited St. Anthony Falls in 1680 it wasn't where it is today! Newton Winchell made a map to show the locations of St. Anthony Falls between 1680 and 1876.

Who was Newton Horace Winchell?

N. H. Winchell was a geologist and a very curious person. He came to Minneapolis in 1872 to work for the University of Minnesota. He was very interested in the geology of the Mississippi River between St. Paul and Minneapolis. As a geologist, Winchell knew some interesting facts about the river bluffs. He knew the bluffs were made of layers of sedimentary rocks and that St. Anthony Falls had receded (moved backwards or upstream on the river.)

But how far and how fast did St. Anthony Falls move? Winchell looked at journals and other records from early explorers such as Hennepin and Carver. He calculated St. Anthony Falls took about 10,000 years to move from Fort Snelling to downtown Minneapolis. Modern research says it took 12,000 years. Winchell was pretty close!

Today you can walk along a trail named after N. H. Winchell. The Winchell Trail in Minneapolis winds through parkland on top of, and past, the geology Winchell examined.

Student Activity

In this activity, you will use Winchell's map to calculate how far and how fast St. Anthony Falls receded between different years.

1. Find the numbers1-4 on the left side of the map. Draw a horizontal line from each number to the scale on the right side of the map. Make sure your line touches the dashed line (the top of St. Anthony Falls.)
2. Now you will make some calculations. Write your answers in the table.

- Calculate the number of <u>years</u> between the time periods listed in the table. Round off to the nearest <u>ten</u>.
- Calculate the number of <u>feet</u> the Falls receded between the time periods in the table. Round off to the nearest <u>hundred</u>.

	Number of years	Number of feet
▪ Hennepin (1680) and Carver (1766)		
▪ Carver (1766) and 1856		
▪ 1856 and 1876		
▪ Hennepin (1680) and 1856		
▪ Hennepin (1680) and 1876		

Graph it!

Use the map to plot the locations of St. Anthony Falls for these dates:

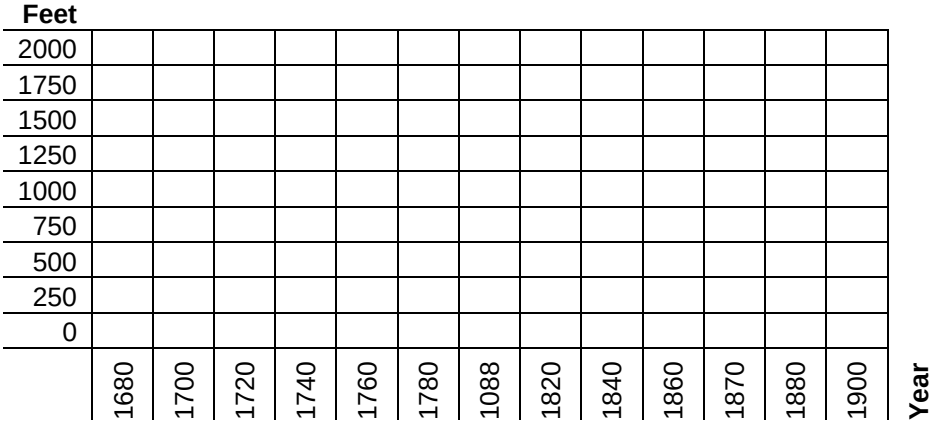
- 1680, 1766, 1856, and 1876.
- Was the speed of recession increasing, decreasing or staying the same from1860 and 1876?

_____

How do you know?

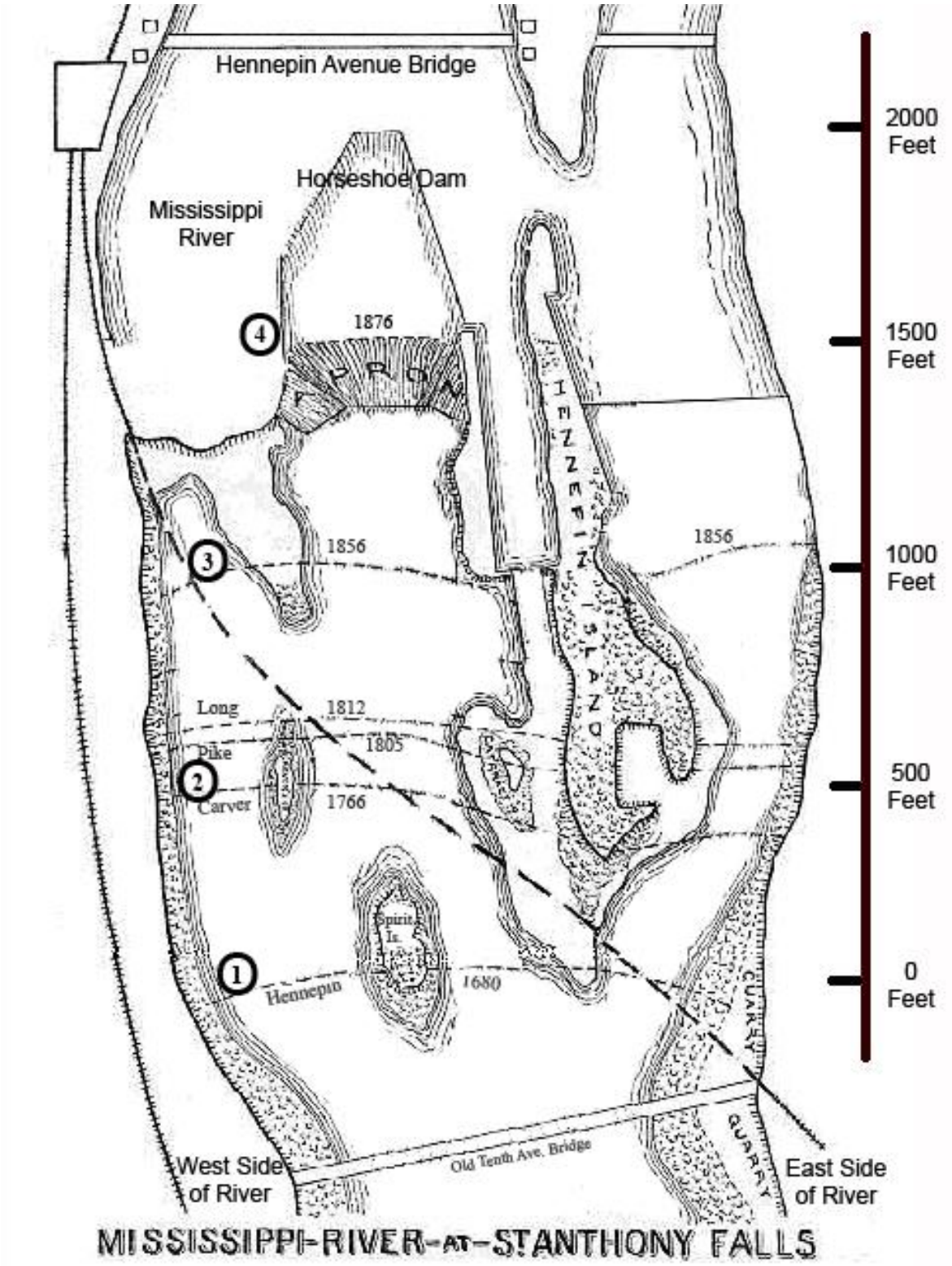
_____

Recession of St. Anthony Falls



Journey to the Falls Student Activity: Geography, Math

A Waterfall on the Move
Part 2: St. Anthony Falls from 1680 to 1876



Use the booklet, “Engineering the Falls” to learn what was happening at St. Anthony Falls in the 1850s – 1870s. Discuss with your class. Your teacher may suggest other resources.

Journey to the Falls Teacher Guide: Geography, Math

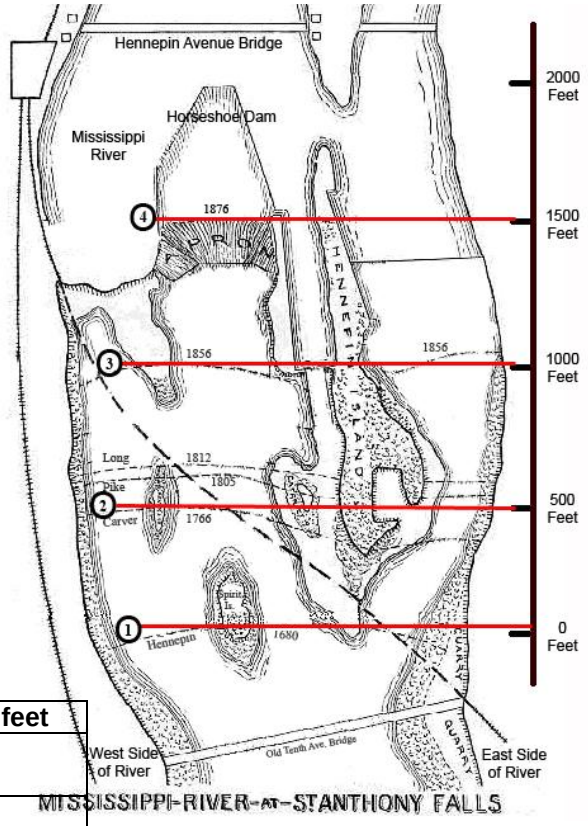
A Waterfall on the Move
Part 2: St. Anthony Falls from 1680 to 1876

Teacher Guide to Student Activity

In this activity, you will use Winchell's map to calculate how far and how fast St. Anthony Falls receded between different years.

1. Find the numbers1-4 on the left side of the map. Draw a horizontal line from each number to the scale on the right side of the map. Make sure your line touches the dashed line (the top of St. Anthony Falls.)
2. Now you will make some calculations. Write your answers in the table.

- Calculate the number of <u>years</u> between the time periods listed in the table. Round off to the nearest <u>ten</u>.
- Calculate the number of <u>feet</u> the Falls receded between the time periods in the table. Round off to the nearest <u>hundred</u>.



	Number of years	Number of feet
▪ Hennepin (1680) and Carver (1766)	**86 (90)**	**500**
▪ Carver (1766) and 1856	**90**	**500**
▪ 1856 and 1876	**20**	**500**
▪ Hennepin (1680) and 1856	**176 (200)**	**1000**
▪ Hennepin (1680) and 1876	**196 (200)**	**1500**

Graph it!

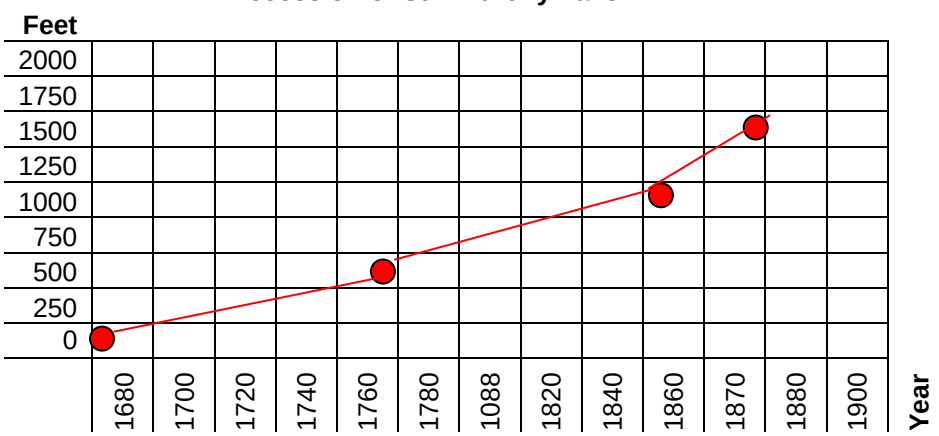
Use the map to plot the locations of St. Anthony Falls for these dates:

- 1680, 1766, 1856, and 1876.

Was the rate (speed) of recession increasing or decreasing? __increasing___

How do you know? ____the line goes up at a steeper angle in a shorter amount of time____

Recession of St. Anthony Falls



A Waterfall on the Move
Part 2: St. Anthony Falls from 1680 to 1876

1. Instruct students to **find number** 1 on the map. Students will **draw** a straight horizontal line from number 1 across the top of the Falls (the dashed line) to the scale on the right. The right side of the line will be near "0 feet." This marks where the Falls were located when Father Hennepin saw St. Anthony Falls in 1680. Repeat for numbers 2, 3, and 4.

2. Calculations

a.) Students will calculate the number of years between when Father Hennepin and Jonathan Carver saw the Falls, between when Carver saw the Falls and 1856, and between 1856 and 1876. Round off all numbers to the nearest ten. Students will write the answer to each calculation on the appropriate line in the "years" space on the left side of the map.
Answers: Hennepin and Carver- 86 years rounded up to 90, Carver and 1856- 90 years, 1865 and 1876- 20 years

b.) Use the scale on the right side of the map to calculate how many feet the Falls receded between the time periods below. Round off to the nearest hundred. Write your answers on the line.
Answers: Hennepin (1680) and Carver (1766) 500 feet, Carver (1766) and 1856 500 feet, 1856 and 1876 500 feet.
The rate (speed) of recession was increasing.

Bonus: If St. Anthony Falls continued to recede or erode at the same rate as it did in the 20 years between 1956 and 1876, where might you expect St. Anthony Falls 20 years after 1876 in 1896?
Answer: St. Anthony Falls would have moved upstream another 500 hundred feet, moving just past the tip of Nicollet Island and just downstream of the Hennepin Avenue Bridge. This is at, or very near, the end of the limestone layer under the Falls. Once the Falls moved past the limestone layer, the Falls would become a series of rapids. The capacity to harness the waterpower would be more difficult and the Falls would have moved past the infrastructure already developed to harness waterpower.

3.) Graph It!
Students will plot the locations of St. Anthony Falls' recession on the graph.
Answers: The speed of recession was increasing. We know this because the line goes up at a steeper angle in a shorter amount of time.

4.) Students will **read and discuss** the booklet "Engineering the Falls." This booklet describes what was happening at the Falls in the 1850s-1870s.
Synopsis: Both saw and flour milling increased rapidly beginning in the 1850s. A water canal was built in 1857 along the river to harness the power of the Mississippi River as it fell over St. Anthony Falls. Construction began in 1876 on an "apron" or covering to protect the Falls from erosion and further recession. Unfortunately the apron also meant the natural look of the Falls was gone. St. Anthony Falls has been in the same location since 1876.

Additional resources:
First Came the River booklet
River of History
http://www.nps.gov/miss/historyculture/collections.htm
Engineering the Falls
http://www.mvp.usace.army.mil/docs/history/engineering.pdf
Forest Fields and Falls
http://discovery.mnhs.org/ConnectingMN/
Wheat Farms, Flour Mills, and Railroads: A Web of Interdependence
http://www.nps.gov/history/nr/twhp/wwwlps/lessons/106wheat/106wheat.htm